

Updating Groundwater Law: New Wine in Old Bottles

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There has been considerable talk, nationally, of impending water crises.¹ Increasing water use, observed nationally² and in Ohio,³ is expected to continue.⁴

There is reason to believe that groundwater⁵ will be called upon to fill an increasing proportion of total water demand. Because of their nature, groundwaters are typically usable without the vast expenditures necessary to build dams and acquire surface acreage to be flooded.⁶ In addition, groundwaters frequently have useful characteristics not shared with surface waters, such as uniformity of temperature,⁷ composition,⁸ and relative freedom from pollution.⁹ Such advantages have been observed in the literature that discusses Ohio groundwater law.¹⁰

Groundwater use is, in fact, increasing at a rate faster than surface water use,¹¹ heightening concern in Ohio about the ability of common-law groundwater rules to continue distributing existing groundwater resources beneficially, efficiently, and equitably.¹² Under these rules, unresolvable clashes between groundwater and surface water users are becoming increasingly more likely.¹³ Concern about conflicts between competing groundwater users resulted recently in new legislation that allows the Ohio Division of Water to intercede as a fact finder in disputes between

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1. F. MOSS, *THE WATER CRISIS* 3, 276 (1967); J. WRIGHT, *THE COMING WATER FAMINE* 15 (1966).

2. WATER RESOURCE COUNCIL, *THE NATION'S WATER RESOURCES SUMMARY REPORT* 1-8 (1968).

3. *Id.* at 1-24.

4. A. RUDNICK, *WATER USE IN OHIO* 27 (Ohio Water Plan Inventory Report No. 6, 1959); WATER RESOURCES COUNCIL, *THE NATION'S WATER RESOURCES* at 6-4-8 (1968) (both treating water use in Ohio). ESTIMATED USE OF WATER IN THE U.S., 1975 10 (U.S. Geological Survey Circular 765, 1977) (treating water use nationally).

5. Groundwater means moisture occupying the interstitial spaces of subsurface sand, gravel, rock, or other material. D. TODD, *GROUNDWATER HYDROLOGY* 15 (1959).

6. E. COOPER, *AQUEDUCT EMPIRE* 128 (1968).

7. A. Walker, *Groundwater Resources of Ohio* 1 (November 18, 1972) (Groundwater Seminar sponsored by John Carroll University).

8. F. Moss, *supra* note 1, at 35.

9. *Id.*

10. Coogan, *Problems of Groundwater Rights in Ohio*, 9 AKRON L. REV. 34, 36-37 (1975); OHIO LEGISLATIVE SERVICE COMMISSION, *STAFF RESEARCH REPORT NO. 115, GROUNDWATER* 1 (1974).

11. C. MCGUINNESS, *THE ROLE OF GROUNDWATER IN THE NATIONAL WATER SITUATION* 83 (U.S. Geological Survey Water Supply Paper No. 1800, 1963); Davis, *Wells and Streams: Relationship at Law* 37 Mo. L.J. 189, 198 (1972).

12. See H. Reese, *Ohio Water Laws* 2 (Feb. 15, 1953) (Paper delivered at the second annual Ohio Water Clinic, Columbus, Ohio); See OHIO LEGISLATIVE SERVICE COMMISSION, *supra* note 10.

13. Davis, *supra* note 11, at 198.

competing groundwater users, but does not affect the legal rules for allocating groundwater.¹⁴

As Ohio groundwater use grows, a fundamental question of groundwater allocation becomes increasingly more important: should Ohio continue distributing groundwater according to the English absolute ownership rule in force now,¹⁵ or according to the American reasonable use rule toward which a growing number of states have gravitated,¹⁶ or should Ohio follow some eastern states and allocate groundwaters through a system of state water-use permits?¹⁷ This article examines the problems that accompany each of these legal systems before proposing a "knowledge doctrine" as an alternative. It is suggested that this knowledge doctrine is consistent with the common law in general and Ohio law in particular,¹⁸ and that it could easily be integrated with surface water management rules as this becomes more desirable in the future.¹⁹

I. PRESENT RULES GOVERNING THE DISTRIBUTION OF GROUNDWATER

In the twenty-seven states located either wholly or partially east of the Mississippi River, groundwater is distributed by either of two absolute ownership rules (the English absolute ownership rule and the American reasonable use rule), or by water-use permit systems. Louisiana appears to be an exception, but the rule in effect in that state operates much like the English absolute ownership rule.²⁰

The English rule, one of two absolute ownership rules,²¹ prevails at the time of this writing in the six eastern states of Ohio,²² Maine,²³ Massachusetts,²⁴ Mississippi,²⁵ Rhode Island,²⁶ and Vermont.²⁷ The English rule protects landowners' rights to use for any purposes percolating groundwaters that have been reduced to possession.²⁸ Under this rule, groundwaters belong to no one until they are drawn from the ground, at

14. OHIO REV. CODE ANN. § 1521.03(E) (Page 1978).

15. *Frazier v. Brown*, 12 Ohio St. 294 (1861).

16. See, e.g., *Nashville, Chattanooga & St. Louis Ry. v. Rickert*, 19 Tenn. App. 446, 457, 89 S.W.2d 889, 896 (1935).

17. OHIO LEGISLATIVE SERVICE COMMISSION, *supra* note 10, at 69-70.

18. See notes 155-90 and accompanying text *infra*.

19. See notes 191-204 and accompanying text *infra*.

20. *Adams v. Grigsby*, 152 So. 2d 619, 623 (La. Ct. of App.), *cert. denied*, 244 La. 662, 152 So. 2d 880 (1963). Louisiana treats water as a "fugitive mineral" like oil or gas, which belongs to any landowner capable of "capturing" it. *Id.*

21. *Kirkwood, Appropriation of Percolating Water*, 1 STAN. L. REV. 1, 2 (1948).

22. *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861).

23. *Chesley v. King*, 74 Me. 164, 170 (1882).

24. *Gamer v. Milton*, 346 Mass. 617, 620-21, 195 N.E.2d 65, 67 (1964).

25. *Clark County v. Mississippi Lumber Co.*, 80 Miss. 535, 544-45, 31 So. 905, 906 (1902).

26. *Rose v. Socony-Vacuum Corp.*, 54 R.I. 411, 173 A. 627 (1934).

27. *Drinkwine v. Vermont*, 131 Vt. 127, 130, 300 A.2d 616, 618 (1973).

28. *Kirkwood, supra* note 21, at 2.

which point the groundwater can be put to any use the landowner wishes, including selling it or transporting it to non-overlying land for use.

The second absolute ownership rule is the American reasonable use rule, which is followed in the ten eastern states of Alabama,²⁹ Connecticut,³⁰ Illinois,³¹ Michigan,³² New Hampshire,³³ New York,³⁴ Pennsylvania,³⁵ Tennessee,³⁶ West Virginia,³⁷ and Wisconsin.³⁸ As under the English rule, groundwaters belong to no one until they are drawn from the ground. The American rule, however, protects landowners' rights to use percolating waters only when these waters are produced and used both reasonably and beneficially on property overlying the producing aquifer.³⁹ When he acts otherwise, the erring user becomes liable to other overlying owners, who have been harmed while in compliance with the rule.

The following example, modeled on the Ohio case of *Frazier v. Brown*,⁴⁰ illustrates the operation of these two absolute ownership rules. *F*, dependent upon groundwater delivered by a spring on *F*'s property, loses this resource when neighbor *B* drills a well that lowers the water table, and then sues *B*. In an English rule jurisdiction such as Ohio, *F* loses since he gets legally enforceable rights in groundwater only when such groundwater has been physically reduced to his possession.⁴¹ In an American reasonable use jurisdiction, *F* may win if *B* has not used the water reasonably and beneficially on property which overlies⁴² the producing aquifer.⁴³ Because sales of water for use apart from the land under which it was produced are per se unreasonable in a reasonable use jurisdiction,⁴⁴ *B*'s sale of water is likely to result in damages and an injunction in favor of *F*.⁴⁵

There are several important variations of the American reasonable

29. *Sloss-Sheffield Steel & Iron Co. v. Wilkes*, 231 Ala. 511, 517, 165 So. 764, 769 (1936).

30. *Wadsworth v. Tillotson*, 15 Conn. 366, 376 (1843).

31. *See Behrens v. Scharringhausen*, 22 Ill. App. 2d 326, 331, 161 N.E.2d 44, 46 (1959).

32. *Hart v. D'Agnostini*, 7 Mich. App. 319, 322, 151 N.W.2d 826, 828 (1967).

33. *Bassett v. Salisbury Mfg. Co.*, 43 N.H. 569, 573-77 (1862).

34. *Forbell v. City of New York*, 164 N.Y. 522, 526, 58 N.E. 644, 646 (1900).

35. *Hatfield Twp. v. Lansdale Mun. Auth.*, 403 Pa. 113, 115, 168 A.2d 333, 333-34 (1961).

36. *Nashville, Chattanooga & St. Louis Ry. v. Rickert*, 19 Tenn. App. 446, 457, 89 S.W.2d 889, 896 (1935).

37. *Pence v. Carney*, 58 W. Va. 296, 305, 52 S.E. 702, 706 (1905).

38. *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 301-02, 217 N.W.2d 339, 350 (1974), *modified*, 63 Wis. 2d 278, 219 N.W.2d 308 (1974).

39. *Rothrauff v. Sinking Spring Water Co.*, 339 Pa. 129, 134, 14 A.2d 87, 90 (1940).

40. 12 Ohio St. 294 (1861).

41. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

42. *Rothrauff v. Sinking Spring Water Co.*, 339 Pa. 129, 134, 14 A.2d 87, 90 (1940).

43. The latin roots of "aquifer" are "aqua" meaning water, and "ferre," meaning to bear. Thus an aquifer is a body of porous rock, gravel, or sand which bears water. D. TODD, *supra* note 5, at 15.

44. RESTATEMENT (SECOND) OF TORTS Explanatory Notes § 858A, at 153 (Tent. Draft No. 17, 1971) [hereinafter cited as RESTATEMENT].

45. *Forbell v. City of New York*, 164 N.Y. 522, 522, 58 N.E. 644, 644 (1900).

use rule. For example, the California correlative rights rule provides for the division of available groundwaters between two competing users who both utilize such waters reasonably and beneficially on the overlying land.⁴⁶ Another example is the American Law Institute's (ALI) redefinition of the American reasonable use rule,⁴⁷ which recently became the law of Wisconsin when that state abandoned the English absolute rule.⁴⁸ Broadening the existing American rule,⁴⁹ the ALI rule provides for liability of one groundwater user to competitors even when waters are used reasonably and beneficially on the overlying land. Liability results if one use causes "unreasonable harm through lowering of the water table or reducing artesian pressure."⁵⁰ Applied to a dispute between *F* and *B*, a court following the ALI rule determines whether the damage done to *F* by *B*'s use is "unreasonable."⁵¹ If *B*, a major water user such as a canning plant, periodically dewateres *F*, a local farmer,⁵² *B* will be liable to *F*.⁵³

Permit systems have been adopted in the ten eastern states of Delaware,⁵⁴ Florida,⁵⁵ Georgia,⁵⁶ Indiana,⁵⁷ Kentucky,⁵⁸ Maryland,⁵⁹ New Jersey,⁶⁰ North Carolina,⁶¹ South Carolina,⁶² and Virginia.⁶³ Four of these jurisdictions apply their permit laws statewide⁶⁴ while the remainder selectively designate those areas where water permits must be obtained.⁶⁵

Generally, permit systems in the eastern states require named categories of water users to obtain permits.⁶⁶ After considering the extent, necessity, and ramifications of the proposed groundwater use, a managing authority is authorized to grant water use rights for time periods ranging

46. *Katz v. Walkinshaw*, 141 Cal. 116, 136, 74 P. 766, 772 (1903).

47. RESTATEMENT, *supra* note 44, § 858(A).

48. *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 301, 217 N.W.2d 339, 350 (1974), modified, 63 Wis. 2d 278, 219 N.W.2d 308 (1974).

49. RESTATEMENT, *supra* note 44, Explanatory Notes § 858A, at 155.

50. *Id.*, § 858A, at 156.

51. *Id.*

52. This situation has occurred in Ohio. OHIO LEGISLATIVE SERVICE COMMISSION, *supra* note 10, at 13.

53. RESTATEMENT, *supra* note 44, § 858A, Comment d, at 159.

54. DEL. CODE ANN. tit. 7, § 6003(a)(3) (1975).

55. FLA. STAT. ANN. § 373.219 (West 1974).

56. GA. CODE ANN. § 17-1106 (Supp. 1971).

57. IND. CODE ANN. § 13-2-2-5 (Burns 1973).

58. KY. REV. STAT. ANN. § 151.140 (Baldwin 1975).

59. MD. NAT. RES. CODE ANN. § 8-802 (Supp. 1974).

60. N.J. STAT. ANN. § 58:4A-2 (West Supp. 1966).

61. N.C. GEN. STAT. §§ 143-215.15, 143-215.16 (1978).

62. S.C. CODE § 49-5-60 (1977).

63. VA. CODE § 62.1-44.97 (Supp. 1950).

64. OHIO LEGISLATIVE SERVICE COMMISSION, *supra* note 10, at 87-89.

65. *Id.* at 89-93.

66. *See id.* at 70.

from years to decades.⁶⁷ The states vary concerning whether waters may be transferred for use away from the land from which they were produced, and what priority of use values will be protected.⁶⁸

The following example recasts *Frazier* as it might be litigated today under Kentucky's permit statutes. When *F* and *B* both make withdrawals of groundwater for domestic purposes or for irrigation, they are exempted from Kentucky's statutory requirement that they apply for and obtain water use permits.⁶⁹ But this exemption does not return them to the prior common law of Kentucky⁷⁰ because the common-law private ownership of groundwaters was purportedly abolished by the statute.⁷¹ Since *B* may withdraw waters without filing a permit application,⁷² he therefore escapes state investigation into the impact of his water use on other groundwater users,⁷³ and *F*'s remedy is to appeal to the legislature.

However, if *B* is an industrial enterprise using more groundwater than the limit established by regulation,⁷⁴ *B* must apply for a water use permit.⁷⁵ When *B* applies for the permit, a state investigation will inquire into the effect of *B*'s water use on the welfare of the public in general, and on other "public water users" in particular.⁷⁶ Aggrieved parties like *F* have an opportunity to articulate their problems⁷⁷ and to appeal any administrative action to the judicial system.⁷⁸ *B*, of course, has the same opportunity.⁷⁹

II. PROBLEMS WITH EXISTING GROUNDWATER ALLOCATION RULES

The implementation of permit systems and the use of absolute ownership rules have been marked by serious problems, the most important of which is that allocation of groundwater under these traditional rules has been carried on in a manner that is both inequitable and economically inefficient. A discussion of these problems will illustrate the shortcomings in existing groundwater law that adoption of the "knowledge doctrine" would correct.

67. *Id.* at 71. See note 131 and accompanying text *supra*.

68. *Id.*

69. KY. REV. STAT. ANN. § 151.140 (Baldwin 1975).

70. *Feldhaus v. Jefferson County*, 264 Ky. 829, 833, 95 S.W.2d 790, 792 (1936).

71. KY. REV. STAT. ANN. § 151.120 (Baldwin 1975).

72. *Id.* § 151.140.

73. *Id.* § 151.170(2).

74. *Id.* § 151.140.

75. *Id.*

76. *Id.* § 151.170(2).

77. *Id.* § 151.180.

78. *Id.* § 151.190.

79. *Id.*

A. *Problems of Absolute Ownership Rules*

A critical evaluation of the absolute ownership rules should, at the outset, note the inadequacy of nineteenth century hydrological information, that shaped the development of those rules⁸⁰ and shares responsibility for their present problems.⁸¹ This inadequacy is illustrated by a typical early opinion which treated the movements of percolating waters as so "secret, occult, and concealed, that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty"⁸² Although this assumption of groundwater ignorance may have been accurate a century ago, its continued domination of groundwater law is inappropriate today.⁸³ One hydrologist, writing of persistent groundwater superstitions in the minds of both "educated" and "uneducated men," notes that "[e]ven a judge in our courts has ruled that 'percolating water moves in a mysterious manner, in courses unknown and unknowable.'"⁸⁴

One problem is that the absolute rules are grossly unfair. Landowners with more powerful pumping equipment may dewater weaker counterparts with impunity under the English absolute rule,⁸⁵ and the American reasonable use rule permits the same result whenever the pumpage is used reasonably and beneficially upon the overlying land.⁸⁶ The essence of the English rule has been described as might makes right,⁸⁷ a description that also applies to the American rule.⁸⁸ The justification for both rules goes back to the days of laissez-faire economics when notions of rugged individualism were endorsed by courts who "simply left the parties where competition had put them."⁸⁹ An owner of land overlying an aquifer who has resources sufficient to obtain superior pumping equipment can turn the aquifer solely to his own use, as long as that use is reasonable and is confined to overlying land in an American reasonable use jurisdiction, irrespective of the amount of land owned by him and of the harm done to other overlying owners. Today, when the value of farms, homes, and investments depends on wells that have been reliable for

80. See Comment, *The Law of Underground Water; a Half-Century of Huber v. Merkel*, 1953 WIS. L. REV. 491, 492-93 (1953).

81. Murphy, *Regulating Groundwater in Humid Zones*, in CONTEMPORARY DEVELOPMENTS IN WATER LAW 57-58 (C. Johnson & S. Lewis eds. 1970).

82. *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861).

83. Coogan, *supra* note 10, at 40-44.

84. C. TOLMAN, GROUND WATER 22 (1937).

85. *Gagnon v. French Lick Spring Hotel Co.*, 163 Ind. 687, 697, 72 N.E. 849, 852 (1904).

86. See *Sloss-Sheffield Steel & Iron Co. v. Wilkes*, 231 Ala. 511, 517, 165 So. 764, 769 (1936).

87. *Meeker v. City of East Orange*, 77 N.J.L. 623, 638, 74 A. 379, 385 (1909).

88. See Comment, *supra* note 80, at 500.

89. Murphy, *supra* note 81, at 55-56.

decades, rules that give no assurance of future groundwater supplies are unfair.⁹⁰

A second problem is risk. As the owners of a "valuable hotel and hotel plant"⁹¹ learned to their chagrin, the only way to guarantee one's groundwater supply under the absolute ownership rules is to buy the groundwater interests of every landowner with property above the same aquifer.⁹² Otherwise, valuable investments can be rendered worthless whenever a competing user comes up with a reasonable use and more powerful pump.⁹³ Man-made uncertainty about the continued accessibility of groundwater therefore discourages water-intensive investments.⁹⁴

Waste is a third problem associated with the absolute ownership rules. It appears in at least three forms: groundwater waste, well-improvement waste, and dependent resource waste. The primary reason for groundwater waste is that under competitive circumstances groundwater users race to deplete the available resource before competitors do.⁹⁵ This race eliminates from consideration productive long-term projects that are not suited to quick destruction of the resource.⁹⁶

The second form of waste results from well-improvement contests.⁹⁷ When the groundwater supply available to one landowner is reduced or extinguished by competing activities that cause a lowering of the water table, the dewatered landowner reacts by installing the smallest well or equipment improvement sufficient to restore the flow.⁹⁸ A series of these incremental improvements will push the well's total cost far beyond that of a well drilled to the same depth in one session. The landowner is burdened with added expenses for unexpected well-improvement projects that arise only because of the uncertain nature of groundwater rights under the absolute ownership rules.⁹⁹

The third variety of waste occurs when perishable resources dependent on water suffer unexpected water losses.¹⁰⁰ The California Supreme Court observed that:

90. Moses, *Basic Groundwater Problems*, 14 ROCKY MTN. MIN. L. INST. 501, 516 (1968) (on the rule of reasonable use).

91. *Pence v. Carney*, 58 W.Va. 296, 298, 52 S.E. 702, 703 (1905).

92. *See, e.g., id.*

93. *Id.*

94. *Cf. NATIONAL WATER COMM'N, WATER POLICIES FOR THE FUTURE* 228 (1973) [hereinafter cited as *NATIONAL WATER COMMISSION*] (explaining need for certainty in water law).

95. Laughlin, *State Management of Ground Water Mining: A System Based on Policy, Fact and Theory*, 6 LAND AND WATER L. REV. 569, 570 (1971).

96. Note, 30 N.Y.U.L. REV. 1419, 1422-23 (1955).

97. Comment, *supra* note 80, at 500.

98. *See, e.g., Behrens v. Scharringhausen*, 22 Ill. App. 2d 326, 327-28, 161 N.E.2d 44, 45 (1959).

99. Comment, *supra* note 80, at 500.

100. *See Forbell v. City of New York*, 164 N.Y. 522, 522, 58 N.E. 644, 645 (1900).

[W]ater is necessary for domestic purposes, and for irrigating the lands of plaintiffs, upon which there are growing trees, vines, shrubbery, and other plants, which are of great value to plaintiffs. All of said plants will perish, and plaintiffs will be greatly and irreparably injured, if the defendant is allowed to divert the water.¹⁰¹

The Court went on to adopt the correlative rights rule,¹⁰² denying the defendant the opportunity to dewater the plaintiff that would have existed under either of the absolute ownership rules.

Aquifer destructibility is a fourth area where the absolute ownership rules merit improvement. By encouraging rapid depletion of groundwater resources, these rules contribute to the geological phenomenon known as "compacting," which occurs as the constituent particles of water-bearing strata settle into the tiny spaces left by overpumped and retreating waters, permanently reducing aquifer permeability.¹⁰³ In the eastern states bordering salt seas, heavy pumping lowers fresh water tables, allows the intrusion of salt waters, and leads to destruction of potable water sources.¹⁰⁴

A fifth problem concerns artificial aquifer recharge that boosts subterranean water levels through injection or induced infiltration of surplus surface waters.¹⁰⁵ Although not heavily used in the past, artificial recharge can be expected to increase as competition for water develops in the future.¹⁰⁶ But who owns spring flood waters injected¹⁰⁷ or spread¹⁰⁸ by a landowner desiring to store them in a natural aquifer? Existing groundwater law was developed to cover use of natural groundwaters.¹⁰⁹ If injected waters are treated analogously, the absolute ownership rules will discourage recharge, because as artificial rechargeant *F* adds to existing groundwater stocks, neighbor *B* may legally pump and use these and other groundwaters as quickly as they accumulate.¹¹⁰

Two additional problems are unique to the American reasonable use variety of the absolute ownership rules. These include a market inflexibility problem and a risk problem which goes beyond that shared with the English absolute rule.

The alienation restrictions of the American rule¹¹¹ reduce the value

101. *Katz v. Walkinshaw*, 141 Cal. 138, 138, 70 P. 663, 664 (1902), *aff'd on rehearing*, 141 Cal. 116, 74 P. 766 (1903).

102. See text accompanying note 46 *supra*.

103. For the effects of this compaction, see *Murphy*, *supra* note 81, at 60-61.

104. *Id.* at 58.

105. D. TODD, *supra* note 5, at 251.

106. See Gleason, *Water Projects Go Underground*, 5 *ECOLOGY L. Q.* 625, 627-28 (1976).

107. D. TODD, *supra* note 5, at 260.

108. Gleason, *supra* note 106, at 627.

109. D. TODD, *supra* note 5, at 304.

110. *Cf. Frazier v. Brown*, 12 Ohio St. 294 (1861) (espousing the English absolute ownership rule).

111. See *Kirkwood*, *supra* note 21, at 3.

and usefulness of groundwater rights. Suppose neighbor C, who does not own land over the producing aquifer, could obtain a higher rate of return from groundwater use than the overlying owner of American reasonable use rights. Because water sales are inherently "unreasonable" under the American rule, contracts for such sales are subject to attack and termination at any time.¹¹² Since water transfers are therefore risky and unreliable,¹¹³ neighbor C may be permanently separated from the only available water supplies, and the resource is not put to its economically best, most productive use.¹¹⁴

The risk problems unique to the American reasonable use rule stem from the "reasonableness" standard that distinguishes it from the English rule, and requires that groundwater be used reasonably on land overlying the producing aquifer. The trend has been toward complication of the criteria that bear on reasonableness of use.¹¹⁵ A good example is the "objective reasonable use" test enunciated in the 1963 Delaware case of *MacArtor v. Graylyn Crest III Swim Club, Inc.*:¹¹⁶

What are the facts pertinent to the reasonable user issue? It seems clear that defendant believed and was reasonably entitled to believe that the well it sank would not interfere with wells such as plaintiffs'. Moreover, plaintiffs' well is objectively marginal with a weak recovery rate. In contrast, it appears the defendant's use is recreational. While such use is not to be condemned, it is not entitled to quite the same consideration as a household use. I recognize however that the comparative number of users may also be a relevant factor. So far as appears only a few property owners are apparently affected, and only the plaintiffs complain legally. Next, the defendant is withdrawing water from the land occupied in amounts which far exceed what would be the "normal" residential water need for such area, assuming its building density would be about the same as that which surrounds the area. Finally, the defendant takes a very large volume of water in concentrated periods.¹¹⁷

Although the effort to minimize the unfairness of the absolute ownership rules is admirable,¹¹⁸ proliferation of reasonableness criteria drastically reduces predictability. Advance planning becomes an impossible task, and the attendant risks discourage long-term water-intensive investments.

B. *Problems of the Permit Systems*

Many eastern states troubled by the flaws of the absolute ownership rules have opted for permit systems,¹¹⁹ but this alternative has problems of

112. *Rothrauff v. Sinking Spring Water Co.*, 339 Pa. 129, 134, 14 A.2d 87, 90 (1940).

113. *Laughlin*, *supra* note 95, at 570.

114. J. HIRSHLEIFER, J. DE HAVEN, J. MILLIMAN, *WATER SUPPLY* 234 (1969) [hereinafter cited as *HIRSHLEIFER*].

115. See *Higday v. Nickolaus*, 469 S.W.2d 859, 866 (Mo. Ct. App. 1971).

116. 41 Del. Ch. 26, 30, 187 A.2d 417, 420 (1963).

117. *Id.*

118. See *id.* at 29, 187 A.2d at 419.

119. See generally statutes cited notes 54-63 *supra*.

its own. One problem is that the alienation restrictions of permit systems cause economic waste.

[C]urrent laws do not effectively establish water rights as property capable of the economic treatment accorded other types of property like land or mineral rights. If water rights were allowed to become secure and certain without limitation on transferability, individual decision-making and the market process would tend to allocate water resources to their most productive use: high-valued uses would bid the water away from low-valued uses. The arguments for establishing water rights in this fashion are the same ones generally justifying the market process and individual decision-making—this process is believed to achieve high efficiency with minimal impairment of individual freedom of choice.¹²⁰

Although a few state statutes expressly allow transfer of permits with state authorities' permission, most do not address this point.¹²¹ Free transferability of permits would defeat an important objective of permit systems: the allocation of groundwater in accordance with a pre-determined hierarchy of groundwater uses.¹²² Since transfers are discouraged, groundwaters cannot move in response to market determinations of their best, most productive use.¹²³ Permits, therefore, lock water into particular uses for fixed periods of time, "even though the value of the water on alternative lands or in alternative uses might be considerably greater."¹²⁴

The problem of uncertainty affects both short- and long-term permit systems.¹²⁵ Short-term permits correspondingly shorten the planning horizon of decision makers,¹²⁶ which may preclude putting groundwaters to their optimal uses. When permanent fixtures, such as heavy machinery, are used in an industrial operation that is dependent upon groundwater sources, the termination of water permits will result in marked reductions in salvage value.¹²⁷ When the use of real property depends upon the availability of water, uncertainty concerning renewal of short-term permits reduces property values.¹²⁸ Long-term financing may be difficult or expensive when repayment of loans is dependent upon the productivity of land which is, in turn, dependent upon reissuance of short-term water-use permits.¹²⁹

Permits for terms of fifty years or more may lengthen decision makers'

120. HIRSHLEIFER, *supra* note 114, at 234.

121. OHIO LEGISLATIVE SERVICE COMMISSION, *supra* note 10, at 71.

122. See HIRSHLEIFER, *supra* note 114, at 42-43.

123. NATIONAL WATER COMMISSION, *supra* note 94, at 251.

124. HIRSHLEIFER, *supra* note 114, at 240.

125. Anderson & Rogers, *Time-Limited Water Permits: Legal and Economic Considerations*, 12 GONZ. L. REV. 193, 226 (1977).

126. *Id.*

127. *Id.*

128. *Id.* at 227.

129. See *id.* at 229.

planning horizons, but toward the end of their legal life they produce the same economic distortions as short-term permits. Investment in real property and personal property with a useful life beyond the expiration date of a permit may be discouraged in businesses that rely upon groundwater because termination of the permit would preclude the business from earning the desired rate of return on the investment. In purchasing a permanent fixture that could not be moved without prohibitive cost, the businessman runs the risk of ending up with a piece of machinery with only scrap value after the termination of a water permit, when the purchaser expected to utilize that machinery as a source of earning power for the remainder of its useful life. Other drawbacks appear in the centralized administration of permit systems. Regulatory lag between requests for action and response by authorities is a threatening problem in permit system jurisdictions.¹³⁰ This is worrisome because of the permit administration need for large amounts of very current information. The grant of a groundwater permit usually requires the state agency to study the impact of the proposed groundwater use upon local patterns of water use and make an assessment about its value. Typically, this weighing must take into account many considerations, some of which are changing on a continuing basis. Such changing considerations might include: the number of parties using an aquifer, and the extent of their uses; the uses to which the groundwater in a particular aquifer are being put, and the utility of those uses; diversions from or reduction of flows in surface watercourses.¹³¹ Final decisions on the allocation of limited groundwater supplies necessitate an evaluation of an extremely complex and changing set of circumstances, and should be based upon current data. Delays in action on groundwater permit allocations, which appear likely in central-

130. Delays of up to ten years have occurred in the similarly regulated utility law area. M. FARRIS & R. SAMPSON, *PUBLIC UTILITIES* 163 (1973).

131. The following is taken from a typical permit system statute, and suggests some of the considerations the state agency must weigh in granting groundwater permits:

In adopting any regulations pursuant to the provisions of G.S. 143-215.14, and in considering permit applications, revocations or modifications under this section, the Environmental Management Commission shall consider:

(1) The number of persons using an aquifer or stream and the object, extent and necessity of their respective withdrawals or uses;

(2) The nature and size of the stream or aquifer;

(3) The physical and chemical nature of any impairment of the aquifer or stream, adversely affecting its availability or fitness for other water uses (including public use);

(4) The probable severity and duration of such impairment under foreseeable conditions;

(5) The injury to public health, safety or welfare which would result if such impairment were not prevented or abated;

(6) The kinds of businesses or activities to which the various uses are related;

(7) The importance and necessity of the uses claimed by permit applicants (under this section), or of the water uses of the area (under G.S. 143-215.14) and the extent of any injury or detriment caused or expected to be caused to other water uses (including public use);

(8) Diversion from or reduction of flows in other watercourses or aquifers; and

(9) Any other relevant factors.

N.C. GEN. STAT. § 143-215.15(h)(1978).

ized permit systems, will lead to unsound and inefficient groundwater allocation decisions.

In sum, permit systems suffer from serious problems. They are not, however, the only alternative to the law of absolute ownership.

III. THE KNOWLEDGE DOCTRINE: AN ALTERNATIVE

The absolute ownership rules are based on the principle "which gives to the owner of the soil all that lies beneath his surface . . . whether it is solid rock, or porous ground, or venous earth, or part soil, part water."¹³² Though hydrological knowledge was not sufficiently developed to enable the landowner to determine how much water was naturally in place "beneath his surface"¹³³ in the past, it now can.¹³⁴ The common law is intended to evolve with changing times.¹³⁵ Since the absolute ownership rules were originally predicated on groundwater ignorance,¹³⁶ those rules should evolve to reflect increasing groundwater knowledge.¹³⁷ To this end, the "knowledge doctrine" would accord the owner of land a right to the groundwater actually contained in the soil beneath his land, which amount of groundwater can now be measured with some precision.

If under absolute ownership theory percolating water belongs to the landowner in the same fashion as soil or rocks,¹³⁸ then it should belong to one landowner only to the extent that groundwaters are naturally in place below that landowner's tract. Suppose landowner *F* lives above an aquifer whose groundwaters are in gradual but constant, roughly unidirectional, motion.¹³⁹ Waters impregnate this body through infiltration from lakes, rivers, surface runoff and assorted human sources.¹⁴⁰ Such waters may be categorized on the basis of their time of arrival: those that have arrived within the most recent year comprise the yearly net "recharge" pool, and those that have accumulated within the aquifer over previous years, the "storage" pool.¹⁴¹ Each pool can be further subdivided into the smaller "tract" pools defined by the surface areas they underlie. With these notions in mind, the English absolute rule can evolve to allow groundwater to be treated like rocks and sand¹⁴² so that

132. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

133. *Id.*

134. See Clark, *The Role of State Legislation in Ground Water Management*, 10 CREIGHTON L. REV. 469, 476 (1977).

135. *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 294-96, 217 N.W.2d 339, 346-48 (1974).

136. Comment, *supra* note 80, at 492, 493.

137. *State v. Michels Pipeline Constr., Inc.*, 63 Wis. 2d 278, 294-96, 217 N.W.2d 339, 346-48 (1974).

138. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

139. D. TODD, *supra* note 5, at 5.

140. *Id.* at 5-7.

141. See Clark, *supra* note 134, at 476.

142. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

one landowner will not be allowed to use the resources of another without permission.¹⁴³ Buttressed by a "knowledge doctrine," the English rule could protect a landowner's right to use groundwaters in an amount not exceeding that landowner's subjacent tract storage pool¹⁴⁴ plus the tract recharge.¹⁴⁵ The knowledge doctrine could similarly modify the American reasonable use rule, although there would appear to be no good reason to sustain that rule's ban on transferring waters away from the overlying land.¹⁴⁶

If *F* is dewatered by *B* in a jurisdiction applying the knowledge doctrine to the English absolute rule, *F*'s remedy depends on whether *B* is

143. *Forbell v. City of New York*, 164 N.Y. 522, 524, 58 N.E. 644, 545 (1900).

144. An Ohio plaintiff might develop this information with expert assistance through state groundwater studies that relate to the area involved. For example, a plaintiff from Venice, Ohio might consult G. Dove, A Hydrologic Study of the Valley-Fill Deposits in the Venice Area, Ohio (Technical Report No. 4, Ohio Department of Natural Resources, Division of Water, 1961). After learning that the specific yield of gravel deposits there would amount to 31 billion gallons, the plaintiff might adjust this figure downward to represent the portion of the aquifer storage pool that underlies the particular property analyzed. *Id.* at 25. The State of Ohio has done numerous groundwater studies, particularly in areas troubled by groundwater problems, and these are listed in a 1975 pamphlet called PUBLICATIONS (Ohio Department of Natural Resources, Division of Water, 1975). Background materials supporting some of these groundwater reports are also available in the open files of the Groundwater Inventory section of the Division of Water.

In the event that additional accuracy is desired or that no study is available, the plaintiff might consult Ohio's water well log file. There are data from over 300,000 water well logs on record with the state, and 15,000 more are added every year. A. WALKER, *supra* note 7, at 6. This file has been said to be "perhaps the largest file of water well records in the United States." GROUNDWATER FOR PLANNING IN SOUTHWEST OHIO 49 (Ohio Department of Natural Resources, Division of Water, 1972). While these logs vary both in quality and content, they generally report basic data about the geological formations that well drillers in the locale have encountered; this may facilitate judgments about the specific yields of a particular aquifer.

In a few cases, information may be obtained through analysis of well cuttings and cores that have been collected by the Ohio Geological Survey. LIST OF PUBLICATIONS 22 (Ohio Department of Natural Resources, Division of Geological Survey, 1977). Where no information is available from any of these sources, test borings may be necessary to assess the value of groundwater storage beneath a particular parcel of property.

145. An Ohio plaintiff might develop recharge information much as he would obtain storage pool figures. The crucial variables are surface water infiltration, precipitation, percolation, and buried valley wall seepage. GROUNDWATER FOR PLANNING IN SOUTHWEST OHIO 54 (Ohio Department of Natural Resources, Division of Water, 1972). In particular, "[t]he most important parameter is surface water infiltration because it generally represents the replenishment source of largest magnitude." *Id.*

A plaintiff in southwestern Ohio, the area that accounts for half of the state's total groundwater use, might establish these variables by consulting the SOUTHWEST OHIO WATER PLAN (Ohio Department of Natural Resources, April 1976). This report indicates that average stream bed leakage rates range from 0.1 to 0.45 million gallons per day from each acre of bed, per foot of head. *Id.* at 175. Stream infiltration can be approximated by measuring the acreage of stream bed on a particular property and the mean water depth. Similarly, basic data concerning rainwater percolation recharge and buried valley wall recharge are available. *Id.* at 176. For plaintiffs in other parts of the state, one of the four other regional water plans might be consulted.

In the future, the availability of information along these lines is likely to improve considerably. For example, in 1972 consultants to the State of Ohio recommended more intensive investigations in the areas of Southwest Ohio where maximum aquifer development is expected to occur, to "evaluate the infiltration capabilities of these systems." GROUNDWATER FOR PLANNING IN SOUTHWEST OHIO, *supra*, at 55. As such studies are undertaken, recharge quantities will be more easily proved.

Although approximations developed in this manner are likely to be rough, they may be modified as better information becomes available. Moreover, a party unhappy with an opponent's approximations is free to suggest and support better estimates.

146. See HIRSHLEIFER, *supra* note 114.

using more groundwater than the share rightfully owned by *B*. By introducing expert testimony, *F* could prove the total amounts of accessible groundwater naturally in place beneath each property owners' holdings. If *B*'s property has, at the time suit is filed, stored over prior years a total of 200,000 acre-feet of accessible groundwater, and an additional 10,000 acre-feet accrue naturally to *B*'s land as net recharge yearly, *B* may make withdrawals only to the extent that these numbers are not exceeded. When *B* has taken 250,000 acre-feet in the first two years of well operation, *B* may be enjoined from taking quantities in subsequent years unless water rights are purchased from *F*. Under the proposed doctrine, *B* has a legitimate claim only to use the one-time quantity of 200,000 acre-feet, plus 20,000 acre-feet representing two years of recharge at 10,000 acre-feet annually.

The feasibility of applying the knowledge doctrine will vary from one locale to another in proportion to the amount of groundwater knowledge available for the area.¹⁴⁷ In some areas, there may already be sufficient hydrological data available to determine the groundwater present in particular parcels of land.¹⁴⁸ Where tract-specific hydrological information is poor, studies could be made to establish the exact size of a given landowner's storage and yearly recharge rights by examining aquifer porosities,¹⁴⁹ thicknesses, and related information. A less expensive alternative would be to base a given landowner's surface rights upon the ratio of his land area to the total land area overlying the aquifer. Application of this ratio to the aquifer's total storage and recharge quantities would give a measure of the individual landowner's storage and recharge rights.¹⁵⁰ If knowledge is not available or is too expensive for a plaintiff's purposes,¹⁵¹ the groundwater ignorance assumption could be affirmed as automatically as in the earliest cases¹⁵² and the groundwater rule prevailing in the jurisdiction could be applied.

Courts hesitant to update absolute ownership law with the knowledge doctrine could be assisted through legislation. State agencies, which would otherwise issue permits, could instead be used as fact-finding bodies to determine aquifer storage and recharge quantities, and to break them into individualized storage and recharge figures. Incorporation of knowledge doctrine principles into the framework of existing groundwater law would be a manageable task, and would contribute to a more efficient and equitable system of groundwater use.

147. See Coogan, *supra* note 10, at 44.

148. See note 142 *supra*.

149. See C. TOLMAN, *supra* note 84, at 482-485.

150. Cf. Clark, *supra* note 134, at 476 (discussing Oklahoma permit system).

151. Coogan, *supra* note 10, at 44.

152. See generally materials cited at notes 155-57 *infra*.

IV. ADVANTAGES OF THE KNOWLEDGE DOCTRINE ALTERNATIVE

The knowledge doctrine alternative has several important advantages over existing methods of allocating groundwaters. It addresses the mentioned faults of both forms of absolute ownership rules,¹⁵³ and answers problems of existing groundwater permit systems as well.¹⁵⁴

Whenever the absolute rules are unfair because they condition groundwater rights on pumping strength, the knowledge doctrine would instead correlate groundwater rights with the natural storage and recharge qualities of each pumper's realty. Knowledge doctrine rights would not be subject to the rampages of any late-comer with a deeper well and a more powerful pump, and investors would not be called upon to shoulder the risk that competing users will pirate their groundwater supplies.

When groundwater waste occurs under existing law because groundwater users compete to deplete the resource, each owner of rights under the knowledge doctrine would be able to legally shield those rights from the predations of others. The occurrence of well-improvement waste as dewatered landowners are forced to make unexpected, unscheduled improvements would be diminished, because groundwater users would be able to predict neighbors' maximum groundwater consumption. Waste of perishable resources resulting from competitors' unexpected water uses would similarly decline.

Under the absolute ownership rules, responsible landowners are powerless to stop destruction of their aquifers by irresponsible groundwater users whose excessive pumping causes compaction or salt water intrusion. Under the knowledge doctrine, however, irresponsible pumpers who use up their own waters would be forced to buy more from others or do without. Responsible landowners would be unlikely to sell cheaply, if they know that the purchaser would destroy the aquifer entirely by excessive pumping. The artificial recharge problem would be eliminated because landowners' withdrawal rights would grow automatically as they artificially expand their yearly recharge pools.

The alienation and uncertainty problems unique to the reasonable use rule may be addressed in at least two ways. First, the reasonable use rule could be abandoned in favor of the English rule supplemented by the knowledge doctrine. The American rule's prime purpose is to redress unfairness problems of the English rule that could be more completely remedied by the knowledge doctrine. Alternatively, once the reasonable use rule is combined with the knowledge doctrine, the former could be modified to permit groundwater sales and to simplify and clarify the factors bearing on "reasonableness." These changes would resolve alienation problems associated with the American reasonable use rule, while improving predictability and limiting risk in the groundwater rights area.

153. See notes 80-118 and accompanying text *supra*.

154. See notes 119-31 and accompanying text *supra*.

The knowledge doctrine similarly addresses the mentioned faults of the permit systems. Permit systems disallow economically efficient market allocation of groundwaters by restricting alienation, but knowledge doctrine rights are not so restricted. Whereas permit systems, because of their temporary nature, generate uncertainty about the future availability of groundwater, the knowledge doctrine would create legally enforceable rights to specific quantities of water. Thus, the knowledge doctrine would reduce risk and encourage sales to those able to achieve greatest return. Finally, under the knowledge doctrine private rights could be allocated privately to minimize the need for centralization with its attendant bureaucratic complexity and regulatory lag. Regulatory agencies would be called upon to adjust private rights only when problems develop.

V. COMPATIBILITY OF THE KNOWLEDGE DOCTRINE WITH THE
ASSERTED GOALS OF EXISTING GROUNDWATER
ALLOCATION RULES

A brief survey of the cases decided under the absolute ownership rules reveals that these early decisions are astonishingly consistent with the knowledge doctrine, and that virtually all of the apparent inconsistencies are attributable to the inadequacy of nineteenth century hydrological information. The foregoing observation is true of the cases that first articulated the English absolute rule,¹⁵⁵ and of those that originally articulated the American reasonable use rule.¹⁵⁶ It is also true of *Frazier v. Brown*,¹⁵⁷ which adopted the English absolute rule in Ohio.

In *Frazier v. Brown*,¹⁵⁸ plaintiff Frazier used spring waters for domestic and agricultural purposes. In 1856 neighbor Brown dug a well that destroyed Frazier's spring. Frazier sued, arguing unsuccessfully for the application of surface stream riparian principles to groundwaters. The court's holding was based on two considerations. First, the court observed that "recognition of any correlative rights, would interfere . . . with the general progress of improvement in works of embellishment and utility."¹⁵⁹ A century later there is concern, ironically, that the absolute rule adopted in *Frazier* interferes with development of commerce and industry by discouraging water-dependent investments.¹⁶⁰ Implementation of knowledge doctrine principles would, on the other hand, provide business investors with a certain groundwater supply and a means of obtaining additional groundwater, if needed. The business risk associated with the uncertainty of continued groundwater supply under the

155. *Chasemore v. Richards*, 11 Eng. Rep. 140 (Exch. Ch. 1859); *Acton v. Blundell*, 152 Eng. Rep. 1223 (Exch. Ch. 1843). See Note, 30 N.Y.U.L. REV. 1419, 1421 (1955).

156. *Swett v. Cutts*, 50 N.H. 439, (1870); *Bassett v. Salisbury Mfg. Co.*, 43 N.H. 569, (1862).

157. 12 Ohio St. 291 (1861).

158. *Id.*

159. *Id.* at 311.

160. Coogan, *supra* note 10, at 42.

English absolute ownership rule would be minimized, and investment encouraged.¹⁶¹

The court also felt that groundwater knowledge was so poor that "an attempt to administer any set of legal rules in respect to [groundwaters] would be . . . practically impossible."¹⁶² Despite this reasoning, the *Frazier* court did recognize the principle that groundwater "is to be regarded as part of the land itself, to be enjoyed absolutely by the proprietor within whose territory it is,"¹⁶³ even though groundwater knowledge was then insufficient to determine the territorial boundaries. The implication was that when such knowledge became available, groundwater law would be updated to reflect that knowledge.

The rule adopted in *Frazier* can be traced back to *Acton v. Blundell*,¹⁶⁴ which the *Frazier* court called "thoroughly argued and considered."¹⁶⁵ In *Acton v. Blundell*, defendant Blundell sank two mineshafts less than three-quarters of a mile from plaintiff Acton's well. Operation of mine drainage equipment interfered with Acton's groundwater supply; he filed suit, arguing in vain that existing watercourse rules should be extended to groundwater. The *Acton* court observed that the source of riparian law was either "mutual consent or agreement"¹⁶⁶ or a "positive law . . . inferred from long-continued acquiescence"¹⁶⁷ of neighboring landowners, but that these rationales could not be carried over to groundwater because "the very existence of the underground springs . . . may be unknown to the proprietors of the soil."¹⁶⁸

This disposition of the watercourse argument made necessary the invention of a special rule governing rights in oozing groundwaters. For guidance, Chief Justice Tindal turned to foundational property principles in the form of the *cujus est solum*¹⁶⁹ doctrine:

[T]he present case . . . falls within the principle which gives to the owner of soil all that lies beneath his surface; that the land immediately below is his property, whether it is solid rock, or porous ground, or venous earth, or part soil, part water; that the person who owns the surface may dig therein, and apply all that is there found to his own purposes at his free will and pleasure¹⁷⁰

Followed strictly, this principle should have given landowners rights to use

161. Murphy, *supra* note 81, at 57.

162. *Frazier v. Brown*, 12 Ohio St. 294, 311 (1861).

163. *Id.* at 308.

164. 152 Eng. Rep. 1223, 1233 (Exch. Ch. 1843).

165. *Frazier v. Brown*, 12 Ohio St. 294, 310 (1861).

166. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1233 (Exch. Ch. 1843).

167. *Id.* at 1234.

168. *Id.*

169. *Cujus est solum ejus est usque ad coelum et ad infernos* translates literally to: "His is his alone and is from the heavens to the depths of the earth." Coogan, *supra* note 10, at 39.

170. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

groundwaters naturally located beneath and within the boundaries of their own property. This result could not be achieved without exacting knowledge of the quantity and location of subjacent groundwaters. Tindal judicially noticed that nineteenth century hydrology was ignorant of such matters:

[Underground water] does not flow openly in the sight of the neighbouring proprietor, but through the hidden veins of the earth beneath its surface: . . . no proprietor knows what portion of water is taken from beneath his own soil: how much he gives originally, or how much he transmits only, or how much receives¹⁷¹

Unable to establish the quantities of groundwater in place below each landowners' surface rights, Tindal said: "[I]f, in the exercise of such right, he intercepts or drains off the water collected from underground springs in his neighbor's well, this inconvenience to his neighbour falls within the description of *damnum absque injuria*, which cannot become the ground of an action."¹⁷² If Tindal and the defendant had been able to assess what portion of water was taken from below the defendant's own soil, and how much from the area below the neighbors' soil, the English rule might well have been different.

Three separate expressions of Justice Tindal support such a supposition. First, Chief Justice Tindal said:

But if the man who sinks the well in his own land can acquire by that act an absolute and indefeasible right to the water that collects in it, he has the power of preventing his neighbor from making any use of a spring in his own soil which shall interfere with the enjoyment of the well. He has the power, still further, of debarring the owner of the land in which the spring is first found . . . from the proper cultivation of the soil.¹⁷³

Extension of riparian law to percolating groundwaters would have created an "indefeasible right" that would interfere with the proper cultivation of soil. But adherence to the English absolute ownership rule creates a similar right that interferes with "the proper cultivation of the soil"¹⁷⁴ when one well owner gains the mechanical "power of preventing his neighbor from making any use of a spring in his own soil."¹⁷⁵ Chief Justice Tindal's economic values are sacrificed on both horns of this dilemma only because nineteenth century hydrology was unable to achieve a finer splitting of water rights.

Second, Chief Justice Tindal feared that extension of riparian law to percolating groundwaters would "impose on a neighbor the necessity of bearing a heavy expense if [he] has erected machinery for the purposes of

171. *Id.* at 1233.

172. *Id.* at 1235.

173. *Id.* at 1234.

174. *Id.*

175. *Id.*

mining and discovers when too late that the appropriation of water has already been made."¹⁷⁶ Because of the risk associated with the absolute rule, failure to adhere to the knowledge doctrine may also impose a surprise "necessity of bearing a heavy expense"¹⁷⁷ on any party whose investments depend on the continued availability of groundwater. The knowledge doctrine would serve to eliminate the risk under absolute ownership rules of sudden and unexpected depletion or exhaustion of groundwater supplies, a risk that Chief Justice Tindal recognized in 1843, but was unable to eliminate because of limited hydrological knowledge.

Third, Chief Justice Tindal feared that the "advantage on one side, and the detriment to the other [might] bear no proportion"¹⁷⁸ were riparian law extended to groundwater. Yet his *Acton* rule allows one pumper to dewater neighboring hospitals and all other entities with complete disregard whether the "advantage on one side" bears any relationship to the "detriment on the other."¹⁷⁹ Chief Justice Tindal had no alternative at the time.

The rationale underlying adoption of the American reasonable use rule is also supportive of knowledge doctrine principles. The seminal American reasonable use rule case is the decision of the New York Court of Appeals in *Forbell v. City of New York*.¹⁸⁰ In that case, the plaintiff's land had been rendered unfit for the growing of celery and water cresses because the groundwater table beneath his land had been lowered when the defendant city pumped groundwater from adjacent land and sold it to city residents. The court conceded that strict application of the English absolute ownership rule would necessitate a judgment for the defendant,¹⁸¹ and purported to continue its adherence to that rule.¹⁸² Nevertheless, a judgment for the plaintiff for damages and an injunction was affirmed with the court fashioning what has come to be known as the American reasonable use rule, although the court regarded its decision as merely a limitation upon the English rule.

The court held that a landowner could make any "reasonable" use of groundwater extracted from his land. Reasonable uses of groundwater did not include merchandising of water for use on land that did not overlay the groundwater reservoir:

[T]o fit it up with wells and pumps of such pervasive and potential reach that from their base the defendant can tap the water stored in the plaintiff's land, and in all the region thereabout, and lead it to his own land, and by

176. *Id.*

177. *Id.*

178. *Id.*

179. *Id.*

180. 164 N.Y. 522, 58 N.E. 644 (1900).

181. *Id.* at 525, 58 N.E. at 645.

182. *Id.*

merchandising it prevent its return, is . . . unreasonable as to the plaintiff and the others whose lands are thus clandestinely sapped, and their value impaired.¹⁸³

The landowner's right of absolute ownership of groundwater extracted from his land derived from the principle "that the water stored or held in [the landowner's] soil so long as it remains there is—unlike water flowing in a surface stream—a part of the soil itself,"¹⁸⁴ which is the precept upon which the knowledge doctrine is based. At the time of *Forbell*, however, the court was faced with the problem "that the percolation and underground flow of water are out of sight and their exact operation and courses are conjectural and not susceptible of actual observation and proof."¹⁸⁵ It was for this reason that the landowner's rights to the groundwater were limited to reasonable use on overlying land; since it was not then possible to discern how much groundwater was held in each landowner's soil, strict application of the English rule would have allowed a landowner to pump off tremendous amounts of groundwater for purposes of sale, even though an unknown and unknowable part of that groundwater might well have been taken from his neighbor's soil. By limiting the amount of groundwater each landowner could use to an amount that could be used reasonably on overlying land, the *Forbell* court was in essence attempting, as best it could in the context of groundwater ignorance that existed then, to limit each landowner's rights to groundwater in a manner that would reasonably approximate that unknown amount of groundwater that he actually owned because it was held in his soil.

Thus, the American reasonable use rule and the knowledge doctrine are in fundamental accord that a landowner owns "the water stored or held in his soil."¹⁸⁶ The only discrepancy between the two—namely, that the American rule limits the landowner's right to groundwater to that amount that can be used reasonably on overlying land—is attributable to earlier technological inability to determine how much groundwater is, in fact, held in a certain piece of land. Hydrological knowledge is now sufficient to make that determination, and the knowledge doctrine simply utilizes that knowledge to accord each landowner the groundwater rights that the authors of the American reasonable use rule agreed were his, that is, the right to the groundwater contained in the soil beneath his land, but were unable to protect because of the then mysterious movement of groundwater.

Both the English absolute rule and the American reasonable use rule recognize as axiomatic "that the owner of the soil may lawfully occupy the space above as well as below the surface to any extent that he pleases"¹⁸⁷

183. *Id.* at 526, 58 N.E. at 646.

184. *Id.* at 525, 58 N.E. at 645.

185. *Id.*

186. *Id.*

187. *Id.*

and "[t]hat a different rule would prevent the reasonable use and improvement of land."¹⁸⁸ In the case of both rules, this has led to a derivative proposition that a landowner has an absolute right to the groundwater beneath his land, although hydrological knowledge available to the courts fashioning those rules could not isolate that right with precision.¹⁸⁹ The knowledge doctrine reflects advances in groundwater information that allow the law to accurately define that groundwater under a landowner's property and finally heed the principle upon which both absolute ownership rules are based, "which gives to the owner of the soil all that lies beneath his surface . . . whether it is solid rock, or porous ground, or venous earth, or part soil, part water."¹⁹⁰

VI. INTEGRATING SURFACE AND GROUNDWATER REGULATION

A major goal of modern water policy should be to maximize the benefits available through use of all water resources,¹⁹¹ whether of surface or underground origin. This becomes more important as water use grows; eventually, all waters will have to be regulated as part of the same hydrological system.¹⁹² To this end, the comparative qualities of each water source must be recognized. For example, surface waters have value for navigation, power generation, and recreation.¹⁹³ They may harbor endangered species.¹⁹⁴ Although groundwaters do not share these intrinsic values, they may establish the water table upon which surface flows and surface storage are based.¹⁹⁵ Additionally, groundwaters may have uniform temperature characteristics that make them more desirable for some purposes than surface waters.¹⁹⁶

Present law does not coordinate its treatment of both sources of water, either to maximize benefits or otherwise. For example, in the eastern states riparian law usually defines surface water rights.¹⁹⁷ This law gives landowners with property adjacent to, and bordering on rivers the right to have river waters maintained in their natural mode, course, and volume,¹⁹⁸ subject only to the reasonable needs of other riparian owners.¹⁹⁹

188. *Id.*

189. See notes 170 & 184 and accompanying text *supra*.

190. *Acton v. Blundell*, 152 Eng. Rep. 1223, 1235 (Exch. Ch. 1843).

191. See NATIONAL WATER COMMISSION, *supra* note 94, at 233.

192. See *id.*

193. *Id.* at 6.

194. See *United States v. Cappaert*, 508 F.2d 313, 315 (9th Cir. 1974), *aff'd*, 426 U.S. 128 (1976); Brief of Amicus Curiae at 1-3, *Columbus v. Teater*, 53 Ohio St. 2d 253 (1978).

195. *Stevens v. Spring Valley Water Works and Supply Co.*, 42 Misc. 2d 86, 95, 247 N.Y.S.2d 503, 511 (Sup. Ct. 1964), *aff'd*, 255 N.Y.S. 2d 466 (App. Div. 1964).

196. A. Walker, *supra* note 7.

197. Davis, *supra* note 11, at 199.

198. *Columbus & Hocking Coal & Iron Co. v. Tucker*, 48 Ohio St. 41, 57, 26 N.E. 630, 632 (1861).

199. Maloney & Plager, *Florida's Lakes: Problems in a Water Paradise*, 13 U. FLA. L. REV. 1, 52 (1960).

Existing riparian law, however, "says nothing about the rights of riparians who are injured by diverters of groundwater which feeds a surface watercourse."²⁰⁰ The common law groundwater rules are hardly better. "They do not address themselves to possible conflicts between a user of percolating groundwater and a user of a hydrologically related surface watercourse."²⁰⁰ The common-law groundwater rules are hardly better.

Given this predicament, the National Water Commission has recommended that "[s]tates in which ground water is an important source of supply commence conjunctive management of surface waters"²⁰² A typical approach has been to establish permit systems for all consumptive uses of water,²⁰³ but this subjects groundwater to the disadvantages previously discussed.²⁰⁴ A better alternative would combine a surface water permit system with groundwater regulation under the knowledge doctrine. By giving private landowners a greater stake in the long term well-being of both their groundwater resources and the aquifer that stores them, the knowledge doctrine should reduce the necessity for, and thus the cost of groundwater regulation. At the same time, the rights of surface water permit holders and owners of land containing groundwater could be clearly defined, and could be the subject of private negotiation between conflicting groundwater and surface water users rather than the focus of litigation in the courts.

VII. CONCLUSION

Early groundwater cases established absolute ownership rights because it was then impossible to divide groundwaters into portions bearing any rational relationship to the producing property. But these unrestricted rights resulted in unfairness, risk, waste, aquifer destruction, limitations upon the utility of artificial recharge, and economic inflexibility that troubled even the earliest judges. Since then advancing technology has increased our options. Progress has made possible a knowledge doctrine capable of addressing many of the problems of the absolute rules by protecting a landowner's right to use groundwaters in an amount not exceeding that landowner's subjacent storage and yearly recharge pools.

With existing law laboring under the burden of increasing water use, it is important that the shaping of future groundwater law be done with an eye on many goals. Tomorrow's groundwater law should be economically sound; it should complement the regulation of surface waters; and it should be fair. The knowledge doctrine seems likely to make an effective contribution toward these ends.

200. Davis, *supra* note 11, at 199.

201. *Id.* at 204.

202. NATIONAL WATER COMMISSION, *supra* note 94, at 234.

203. Maloney & Ausness, *A Modern Proposal for State Regulation of Consumptive Uses of Water*, 22 HASTINGS L. J. 525, 525-26 (1972).

204. See text accompanying notes 129-41 *supra*.